The Tekne Group, Inc.
Bosik Consultants Limited, Ottawa

NIJ

Royal Canadian Mounted Police

JOINT U.S. AND CANADIAN DEVELOPMENT OF TESTING PROCEDURES FOR EVALUATION OF PERSONAL BODY ARMOR PERFORMANCE AGAINST AUTOMATIC WEAPONS

Joint Services Small Arms Systems
Annual Conference
Little Rock, AR
August 2001

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Report Documentation Page

Report Date	Report Type	Dates Covered (from... to)
13Aug2001	N/A	-

Title and Subtitle Joint U.S. and Canadian Development of Testing Procedures for Evaluation of Personal Body Armor Performance Against Automatic Weapons	**Contract Number**
	Grant Number
	Program Element Number
Author(s) Lightsey, Steven L.; Boskik, Anthony J.	**Project Number**
	Task Number
	Work Unit Number
Performing Organization Name(s) and Address(es) The Tekne Group, Inc. Bosik Consultants Limited, Ottawa	**Performing Organization Report Number**
Sponsoring/Monitoring Agency Name(s) and Address(es) NDIA (National Defense Industrial Association) 211 Wilson Blvd, STE. 400 Arlington, VA 22201-3061	**Sponsor/Monitor's Acronym(s)**
	Sponsor/Monitor's Report Number(s)

Distribution/Availability Statement
Approved for public release, distribution unlimited

Supplementary Notes
Proceedings from the 2001 Joint Services Small Arms Symposium, Exhibition & Firing Demonstration 13-16 August 2001 Sponsored by NDIA, The original document contains color images.

Abstract

Subject Terms

Report Classification unclassified	**Classification of this page** unclassified
Classification of Abstract unclassified	**Limitation of Abstract** UU

Number of Pages
12

PROGRAM PARTICIPANTS

- JOINT U.S. AND CANADIAN STANDARDS DEVELOPMENT
  - **DOJ NATIONAL INSTITUTE OF JUSTICE (DOJ/NIJ)**
    - *OFFICE OF SCIENCE & TECHNOLOGY*
      - MS. WENDY HOWE, PM STANDARDS AND TESTING
    - *NIST OFFICE OF LAW ENFORCEMENT STANDARDS (OLES)*
      - MR. KIRK RICE
      - MR. STEVEN LIGHTSEY
  - **CANADIAN POLICE RESEARCH CENTER (CPRC) RCMP**
    - *DEFENCE RESEARCH ESTABLISHMENT VALCARTIER (DREV)*
      - MR. GILLES PAGEAU
    - *ROYAL MILITARY COLLEGE (RMC)*
      - JOSEE MAILLETTE
    - *BOSIK CONSULTANTS LIMITED (BCL)*
      - ANTHONY BOSIK

BODY ARMOR STANDARDS

- BACKGROUND
  - **NIJ STANDARD-0101.04**
    - *25+ YEARS OLD*
    - *FIRST BODY ARMOR STANDARD FOR LAW ENFORCEMENT*
    - *SIX SINGLE HITS PER PANEL*
  - **CANADIAN GENERAL STANDARDS BOARD (CGSB) 179.1**
    - *NEWLY ADOPTED IN 2001*
    - *BASED ON NIJ STANDARD*
    - *OPTIONAL MULTI-HIT PROCEDURE (SPACING AND PATTERN)*
  - **prEN ISO 14876 PARTS 1 & 2**
    - *IN RATIFICATION PHASE*
    - *BASED ON NIJ STANDARD*

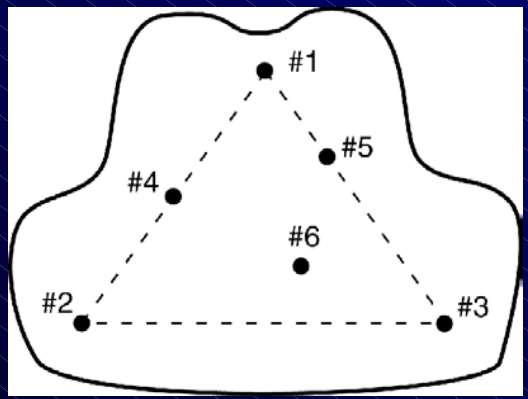
SINGLE VS MULTIPLE IMPACTS

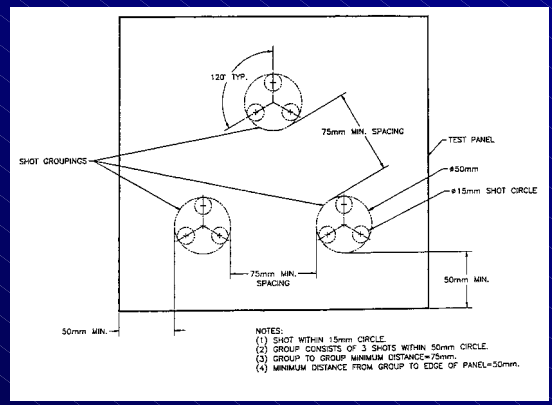
- SINGLE HIT
  - **ISOLATED WITH RESPECT TO TIME BETWEEN IMPACTS**
    - *ONE ROUND PER TRIGGER PULL*
    - *TIME INTERVALS BETWEEN IMPACTS - SECONDS OR LONGER*
    - *INDIVIDUALLY AIMED*
  - **NIJ STANDARD, OTHERS, BASED ON SINGLE HIT, MULTIPLE TIMES**
    - *AUTOMATIC WEAPONS BECOMING MORE PREVALENT AS LE THREAT*
    - *OFFICER WEAPONS AND ASSAILANT WEAPONS*
    - *TACTICAL AND DUTY ENVIRONMENTS*
- MULTIPLE (MULTI) HIT
  - **GROUPED WITH RESPECT TO TIME BETWEEN IMPACTS**
  - **CONTROLLED BURSTS OR FULL AUTOMATIC FIRE**
    - *TIME INTERVALS IN MILLISECONDS*
    - *LESS CONTROLLED FOR AIM, THUS IMPACT SPACING/PATTERN*

RESEARCH PROGRAM

Royal Canadian Mounted Police

- DEVELOP TEST METHODS AND PROCEDURES
  - **TRUE MULTI-HIT IMPACTS**
    - *TIME RESOLVED FOR AUTOMATIC RATES OF FIRE*
    - *REPRESENTATIVE SHOT SPACING AND PATTERNS*





  - **STANDARDIZED LABORATORY METHODS AND EQUIPMENT**
    - *CONSISTENT, AFFORDABLE*
    - *VALIDATED METHODS, EQUIPMENT, PROCEDURES*
    - *POTENTIAL FOR INCLUSION IN FUTURE NIJ AND CGSB*

PROGRESS

Royal Canadian Mounted Police

- AUTOMATIC WEAPONS
  - **IDENTIFICATION AND SELECTION**
    - *RMC LED EFFORT*
      - DRAFT REPORT IN REVIEW – FINAL EXPECTED IN FALL 2001
  - **CLASSED BY BARREL LENGTH**
    - *APPROXIMATELY 6 IN. OR LESS (MACHINE PISTOLS)*
    - *APPROXIMATELY 6 TO 12 IN. (SUBMACHINE GUNS)*
    - *APPROXIMATELY 12 IN. OR LONGER (ASSAULT RIFLES)*
  - **COMPARISONS MADE BY**
    - *CALIBER*
    - *NOMINAL VELOCITY AND KINETIC ENERGY*
    - *RATE OF FIRE*
    - *ORIGIN, FIRING DESIGN/MECHANISM NEGLECTED*

Royal Military College of Canada

WEAPONS SELECTION

Royal Canadian Mounted Police

- ACQUISITION OF WEAPONS FOR STUDY (RMC)
  - **AVAILABILITY BASED – CANADIAN SOURCES**

Skorpion Model 61

Ingram MAC-10

Beretta 38A

H&K MP-5

Sterling SMG

M4

Carbine

C7A1

AK-47

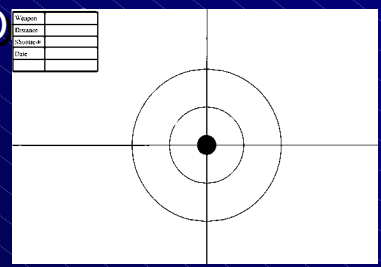
C2

WEAPONS CHARACTERIZATION

Royal Canadian Mounted Police

- ATTRIBUTES MEASURED
  - **BALLISTICS**
    - *VELOCITY*
    - *RATE OF FIRE*
    - *BURST AND FULL AUTOMAT*

  - **IMPACT BALLISTICS**
    - *AIMED BURST IMPACTS (3 SHOT BURSTS)*
    - *SNAP FIRED BURST IMPACTS (3 AND 9 SHOT BURSTS)*
      - SHOULDER, AIM, FIRE IN LESS THAN 2 SECO
    - *5 METER (16.4 FT) RANGE*



SHOOTER INFLUENCES

Royal Canadian Mounted Police

- TYPED USING PRESCRIBED PROTOCOL
  - **FAMILIARIZATION – 3 BURSTS OF 3 SHOTS AT 5 M**
  - **AIMED BURSTS – 3 SHOT BURST AT 5 M**
  - **SNAP BURSTS – 3 AND 9 SHOT BURSTS AT 5 M**
- CLASSED BY RESULTS AS
  - **EXPERT**
  - **EXPERIENCED**
  - **INEXPERIENCED**
- CHARACTERIZATION
  - **EACH WEAPON**
  - **EACH CLASS OF SHOOTER**

SAMPLE IMPACT BALLISTICS

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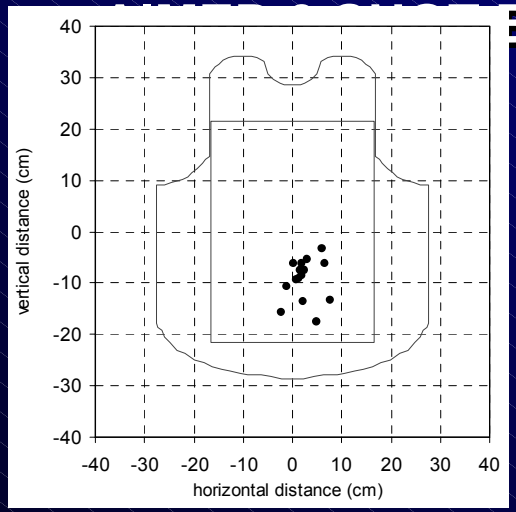
- COMPOSITE IMPACT LOCATIONS OF ALL SHOOTERS

BURSTS AT 5 M



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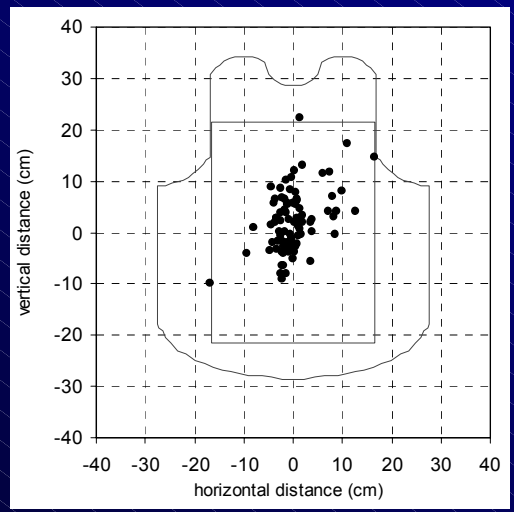
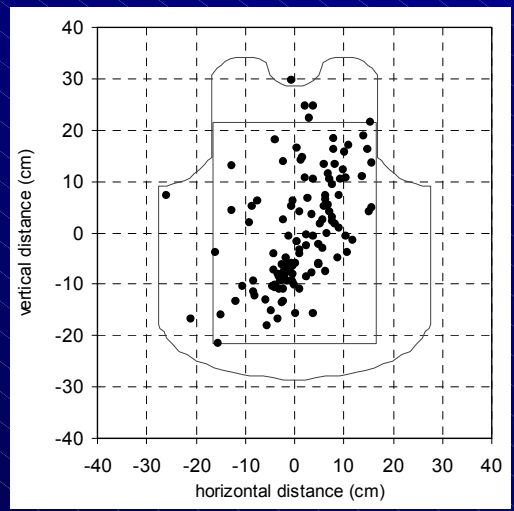


MP 5



AK-47

LABORATORY SIMULATION

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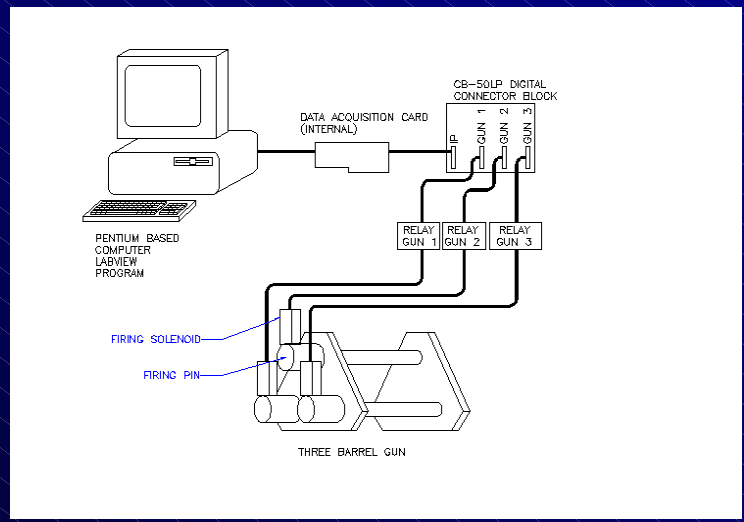
- BCL 3-BARREL TEST FIXTURE
  - DEVELOPED FOR CGSB 3 SHOT IMPACT GROUP
  - TEST BARRELS – SELECTION OF CALIBERS, LENGTHS, TWISTS
  - SHOT SPACING AND PATTERN CONTROLLED
  - RATE OF FIRE CONTROLLED BY PC/SOFTWARE



CONCLUSION

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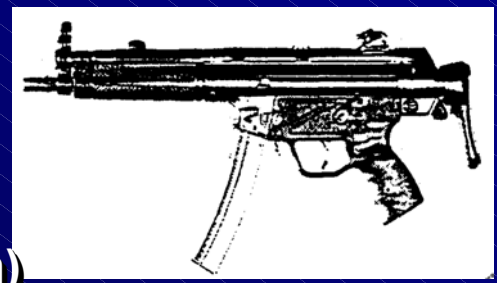
- PRELIMINARY RESULTS SHOW
  - **SHOT SPACING MAY BE CLOSER THAN USED IN CURRENT TESTS**
    - *EQUILATERAL VERSUS ASYMMETRIC SPACINGS*
  - **SHOT PATTERNS IN GENERAL REFLECT**
    - *TRIANGULAR SHAPES (EQUILATERAL AND ASYMM*
    - *STRAIGHT LINE EQUAL AND VARIABLE DISTANCES*
  - **TIME BETWEEN IMPACTS CRUCIAL WITH RESPE**
    - *ARMOR RESTRAINT ON TEST FIXTURE*
    - *BACKING MATERIAL ELASTIC RESPONSE*



- FINAL WEAPONS SELECTION
  - **MP5 SUBMACHINE GUN (9 X 19 mm Parabellum)**
  - **INGRAM MAC 10 MACHINE PISTOL (.45 caliber ACP)**
  - **BASED ON RATE OF FIRE, ACCURACY, CALIBER/ENERGY**
    - *CONSERVATIVE CHOICES WITH RESPECT TO SEVERITY OF THREAT TO ARMOR*